Unit 5

Green Skills

Introduction

The environment around us affects all aspects of our life; and all our day-to-day activities also affect the environment. Those who live in cities get their food supply from surrounding villages and in turn, are dependent on forests, grasslands, rivers, seashores, for resources, such as water, fuel wood, fodder, etc. We use resources from which food is made and we depend on the community of living plants and animals, which form a web of life. Everything around us forms our environment and our lives depend on the flora and fauna around us. Similarly, our school environment comprises the physical and the socio-cultural environment. The physical environment includes the school building and the classrooms, library, laboratories corridors, kitchen, toilets, garden and also the playground. The socio-cultural environment is manifested by the school, with climate teaching, by the teachers, student activities, inclusivity, attitude towards learning, social behaviour, discipline, respect for each other's caste, religion and creed, achievement of students, etc.

Over the years, with economic development, there has been an increase in environmental pollution. For example, with the advent of high input agriculture, we could grow more food by using fertilisers and pesticides and using hybrid crops, but it also resulted in the ill effects of overuse of chemicals, which led to soil and environmental degradation. This threatens the stability of the environment. We need to plan the maintenance of the areas in a sustainable manner so that we can enjoy the good environment created by us;it may be sustainable agriculture, developing eco-fashion design, manufacturing of solar panels, or designing environmentally sustainable homes.

Session 1: Society and Environment

The Constitution of India contains specific provisions for the protection and improvement of environmental quality. Article 48-A of the Constitution says that "the state shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country."

People live together in villages, cities, states and countries,thus forming a 'Society'. Society interacts with the environment, and changes it at the same time. The interaction of the society with the environment sometimes affects the ecological balance in the environment. With the increase in population and economic activities, people's interference with nature has started destroying the environment. The industrial development and intensive agriculture that provides the goods for our increasingly consumer-oriented society uses up large amounts of natural resources, such as water, minerals, petroleum products, wood, etc.

Natural resources

A resource can be defined as any natural or artificial substance, energy or organism, which is used by human being for its welfare. Ever since the earth was inhabited, humans and other life forms have depended on things that exist freely in nature to survive. These things include water, land, soils, rocks, forests, animals, fossil fuels and minerals. They are called natural resources as they are the basis of life on earth. We use these resources to survive and also to function properly. Natural resources can be consumed directly or indirectly. For instance, humans depend directly on forests for food, biomass, health, recreation and increased living comfort.

Indirectly forests helps in regulating climate, preventing flood, storm protection and nutrient cycling. The resources, which have been developed by human beings during the growth of civilisation, are called artificial resources. For example, biogas, thermal electricity, plastics, etc.

Natural resources come in many forms. It may be a solid, liquid or gas. It may also be organic or inorganic. It may also be metallic or non-metallic.

(i) **Land Resources:** Human beings thus, use land as a resource for production as well as residence and recreation. It is a finite resource which is subject to agricultural and non-agricultural uses, such as infrastructure development.

(ii) **Forest Resources:** A forest is a natural, self-sustaining community characterised by vertical structure created by presence of trees. Wood is used for making furniture, tool-handles, railway sleepers, matches, ploughs, bridges, boats, etc. and as a source of energy for cooking purpose and for keeping warm. Tannins, gums, drugs, spices, insecticides, waxes, honey, horns, musk, ivory, hides, etc. are all provided by the flora and fauna of forests.

(iii) **Water Resources:** Water covers about three-quarters of Earth's surface and is a necessary element for life. Water resources include rivers, lakes, oceans, and underground aquifers, etc. Water is a vital resource in agriculture, industrial, household and recreational and environmental activities.

(iv) **Mineral Resources:** A mineral deposit is a concentration of naturally occurring solid, liquid, or gaseous material, in or on the Earth's crust in such form and amount that its extraction and its conversion into useful materials or items are profitable now or may be so in the future. Mineral resources are non-renewable and include metals (e.g., iron, copper, and aluminium), and non-metals (e.g., salt, gypsum, clay, sand, phosphates). Some minerals consist of a single

element, such as gold, silver, diamond (carbon), and sulphur.

(v) **Food Resources:** Resources that are used as food, or provide food for organisms are called food resources. Plants serve as food resources for herbivores and omnivores. Animals and birds are the source of food for many organisms who are carnivores and omnivores. Agriculture is the main source of plant food resource for human beings.

(vi) **Energy Resources:** An energy resource is something that can produce heat, power life, move objects, or produce electricity. There are 5 fundamental sources of energy: (i) Nuclear fusion in the Sun (solar energy), (ii) Gravity generated by the Earth and Moon, (iii) Nuclear fission reactions, (iv) Energy in the interior of the Earth, and (v) Energy stored in chemical bonds. Most of the energy we use today come from fossil fuels (stored solar energy). But fossils fuels have a disadvantage in that they are non-renewable on a human time scale, and causes other potentially harmful effects on the environment.

Natural resources fall under the following main categories:

(a) Inexhaustible Resources: The resources which cannot be exhausted by human consumption are called inexhaustible resources. These include energy sources like solar radiation, wind power, water power and tidal power, etc.

(b) Exhaustible Resources: There are some resources, which are available in limited quantities and are going to be exhausted as a result of continuous use. For example, the stock of coal in the earth is limited and one day there will be no more coal available for our use, if we keep on using it excessively.

(c) Renewable Resources: Renewable resources are those that are constantly available (like water) or can be reasonably replaced or recovered, like vegetative lands (Table 5.1). Even though some renewable resources can

be replaced, they may take many years to form and that does not make them renewable.

Some of the exhaustible resources are naturally regenerated after consumption and are known as renewable resources. e.g., Forest trees and plants that make a forest may be destroyed but new ones grow in their place. But if forest is totally cut down to get land for construction of buildings, it is lost forever.

Renewable energy systems use resources that are constantly replaced and are usually less polluting. Examples include hydropower, solar, wind, and geothermal (energy from the heat inside the earth).

(d) Non-renewable Resources: Non-renewable resources are those that cannot easily be replaced once they are destroyed (Table 5.1). For example, fossil fuels. Minerals are also non-renewable because even though they form naturally in a process called the rock cycle, it can take thousands of years, making it non-renewable. Non-renewable resources can be called inorganic resources if they come from non-living things. For example, minerals, wind, land, soil and rocks.

Table 5.1: Non-renewable and Renewable Resources

Non-renewable Resources	Renewable Resources
	
Coal Coal is one of the cheapest sources of fuel.It is used in power houses, factories and houses for cooking and heating.	**Water** Only about 2.5 % of water on earth is fresh water. Energy from rivers is used to make electricity. Energy produced by tides in sea and oceans can also be converted into electricity.
Petroleum It includes petrol, diesel and mineral oils. It is used to run motor vehicles, furnaces and power-houses.	**Sun** Sun's energy can be used to generate electricity. These are used in calculators, street lamps, and even in room heaters and water heaters.

LPG Liquefied petroleum gas (LPG) is made from petroleum gas. LPG is used for cooking and also for running vehicles.	**Wind** The energy from the force of the wind is wind energy. This energy can be used for work as grinding grain, pumping water, etc. This energy can also be converted to electricity.
Natural Gas It is formed by decomposition of dead animals and plants that are buried under lakes and oceans. It is found above the oil in the oil wells. Compressed natural gas (CNG) is used for running vehicles.	**Biomass** Energy can be produced by wastes from plants and animals. It can be used for any heating purpose, such as cooking. It can also be used to produce electricity and heat.
Nuclear Plants Nuclear energy is made available to us with the help of nuclear power plants. Nuclear energy is becoming a common source of electricity throughout the world. It has the danger of causing great harm in case of an accident.	**Soil** Nutrients in the soil helps plants grow. Soil is used to provide shelter. Soil quality gets damaged due to addition to harmful chemicals, land pollution, construction activities, and cutting down of trees.
Minerals The earth contains minerals like gold, bauxite, mica, iron-ore and many others. They are reducing as larger and deeper mines are being dug to obtain these minerals. Mining these minerals causes damage to the earth.	**Forests** Forests are necessary to preserve ecology. They play an important role in providing clean air and attracting rain clouds. They also provide the wood, fruits, and plant products which have medicinal value.

Traditional societies had a small population and required less resources. They could preserve their biodiversity as a life supporting resource. But today, with the increasing consumerism and affluent societies, resources are getting rapidly depleted, even to the extent of leading to the irrecoverable loss due to extinction of several plant and animal species. Some of the human activities, which cause damage to the environment are over exploitation of resources, pollution, deforestation, mining, destruction of natural habitats, construction, etc. Let us now discuss how some of these activities are damaging our earth and environment.

(i) Overexploitation: This results when harvesting of resources exceeds their reproduction or replenishment. It means that when we exploit the species faster than the natural populations can recover, then it may result in extinction of the species, thus affecting directly or indirectly

the ecological cycle and our environment. For example, removal of wild medicinal plants, excessive grazing of pastures by animals, destruction of forests, and water aquifers, overfishing and over hunting, results in overexploitation of forests and natural habitats.

(ii) Mining: Mines are dug below the earth's surface to get ores. The ores are then refined to extract the valuable elements, such as metals, gems, minerals, etc. Some of the environmental impacts of mining include erosion, formation of sinkholes, loss of biodiversity, and contamination of soil, groundwater and surface water by chemicals from the mining processes.

(iii) Deforestation: It is the clearance of a forest or stand of trees where the land is converted to a non-forest use, such as agriculture and construction of houses. It results in loss of habitat for many plants and animals living in the forest. It may also lead to extinction of plant and animal species.

(iv) Pollution: This word is derived from the Latin word "*polluere*" meaning "to soil" or "defile (contaminate)". Pollution is caused by pollutants, which may be solid, liquid or gaseous in nature. Pollution is the effect of undesirable changes in our surroundings that have harmful effects on plants, animals and human beings. Pollutants are produced due to human activity, which have a detrimental effect on our environment. For example, factories consume a lot of water and electricity and release harmful chemicals in air, land and water, thus contaminating the atmosphere. Water pollution caused by factories and other industries can be the most serious problem. They also pollute the air through fossil fuel emissions. These emissions include carbon dioxide, methane, and nitrous oxide, which are harmful to the living beings.

Pollutants are of two types, as described in Table 5.2.

Table 5.2: Pollutants

Pollutants that can decompose	Pollutants that cannot decompose
Pollutants that break down into simpler, harmless substances naturally (by the action of moisture and bacteria) are called biodegradable pollutants	Pollutants which cannot be broken down into simpler and harmless substances are called non-biodegradable pollutants. The harmful effect caused by these pollutants will be there for hundreds of years.
Examples: vegetable waste, sewage waste, paper, wood, cattle dung, agricultural waste from organic farms, etc.	Examples: plastics, insecticides, pesticides, chemicals like mercury or lead, aluminium, glass, etc.

Some of the other factors responsible for polluting the environment are as follows:

- Exhaust fumes released from vehicle pollutes the air.
- Excessive use of chemicals in agriculture (like insecticides and fertilisers) affect the alkailinity of the soil or the soil pH. It adversely affects the health of microorganisms and other organisms in the soil.
- Plastic waste like bottles, bags, etc., thrown on land and sea pollutes the water and destroys the flora and fauna.
- Dangerous gases (cholorofluorocarbons or CFCs, methane, carbon dioxide, etc.) released into the air.

The various types of pollution are summarised in Table 5.3.

Table 5.3: Types of Pollution

	Land Pollution	Water Pollution	Air Pollution
What it is?	• Damage to the land because of harmful substances is known as land pollution.	• Adding harmful substances and disease causing bacteria and other microorganisms to rivers, lakes, and oceans results in water pollution.	• Addition of harmful gases and particles in air results in air pollution.

	Land Pollution	Water Pollution	Air Pollution
What happens because of this pollution?	• Diseases, such as dysentery, cholera and typhoid • Less land is available for use of forests, farms or homes	• Diseases, such as dysentery, diarrhoea, jaundice, typhoid, etc. • Local earnings, like tourism, fishing, etc. are adversely affected. • Less drinking water	• Heart and breathing problems and cancers. • Climate change, droughts, famines and floods
Why does it happen?	• Cutting down forests • Harmful pesticides and fertilisers • Mining and heavy construction • Release of sewage, toilet waste, waste from houses/factories, and chemical waste	• Throwing waste in water • Leakage from sewer lines • Release of waste water from houses, farms and factories • Accidental oil leakage from ships	• Burning of fuels • Smoke from traffic • Burning waste and remains of crops • Pesticides and fertilisers • Smoke from factories • Dust from construction
How to prevent it?	• Reduce waste • Segregate (separate) waste products • Plant trees • Adopt natural and organic farming methods • Use biodegradable items	• Do not throw waste into water bodies • Do not throw chemicals, medicines, oils, etc., in drains • Avoid using pesticides and fertilisers • Ensure proper treatment of sewage and factory waste • Use water wisely	• Use renewable sources of energy • Avoid polluting vehicles • Stop others from burning waste and left-over crops • Avoid pesticides and fertilisers which release harmful gases

If we separate all our waste before throwing it away, it will help us manage the non-biodegradable pollutants in a better manner. For example, if you keep all your vegetable waste covered in soil for some weeks, it will make the soil fertile and you will have less waste to throw away. Also harmful wastes can be separated from water before it mixes into our drinking water.

Climate change

Have you ever sat in a car or bus which has been parked in an open area under the sun, with windows

closed for a long time? Have you felt that it is much hotter inside a closed vehicle because the heated air is blocked inside? Similarly, the earth is becoming hotter because of burning fossil fuels (coal, petrol, diesel, etc.). These gases trap and prevent the earth's heat from escaping, leading to a global warming. This is called the "greenhouse effect".

Forests are the main mechanism for the conversion of carbon dioxide into carbon and oxygen. The loss of forest cover, coupled with the increasing release of carbon dioxide and other gases through industrialization contributes to the 'greenhouse effect'. Some greenhouse gases occur naturally and enter the atmosphere as a result of both natural processes (such as decomposition of organic matter) and human activity (such as burning fossil fuels and agriculture).

Greenhouse gases that occur both naturally and from human activities include water vapour, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and ozone (O_3). Other greenhouse gases have essentially no natural sources, but are the side products of industrial processes or manufactured for human purposes, such as cleaning agents, refrigerants, and electrical insulators. These include the fluorinated gases: chlorofluorocarbons (CFCs), hydro chlorofluorocarbons (HCFCs), hydrofluorocarbons (HCFCs). This greenhouse effect causes snow to melt very fast.

Carbon dioxide emissions into the atmosphere from burning oil, coal and gas for energy use is a serious problem as it is harmful to the environment. Carbon dioxide in the atmosphere has increased by 31% since pre-industrial times, causing more heat to be trapped in the lower atmosphere. As a result, there are frequent floods and changes in climate as well as damage to crops and animal life.

Harmful radiation

You might be knowing that the atmosphere protects us from harmful radiation from the sun. This is done by a layer all around the earth, in the atmosphere, called the 'Ozone Layer'. It is made of a gas called 'Ozone'. This

layer in the atmosphere protects us from the harmful radiation.

Cleaning chemicals, coolants in refrigerators and air-conditioners, etc., release ozone depleting substances, such as chlorofluorocarbons in the atmosphere. These destroy the ozone in the atmosphere, making 'holes' in the ozone layer. The harmful radiation comes in through these 'holes' and cause increased incidence of health disorders, such as skin cancer.

Natural disasters

Natural disasters include floods, earthquakes, landslides, storms, etc. Our actions in exploiting natural resources for building structures, such as large dams and buidlings sometimes aggravates the impact of natural calamities and disasters.

Saving the environment: What can you do?

To save our environment, we need to educate people. Education is important, as it gives people the knowledge and skills that they need to perform. Educating people about the environment, through the environment and for the environment will enlighten them in utilizing their knowledge and skills for saving the environment as responsible citizens.

(i) Learning about the environment: Learning about the environment focuses mainly on acquisition of knowledge and understanding of our surroundings and related issues.

(ii) Learning through the environment: Learning through the environment refers to the processes of learning while being engaged with environment inside and outside the classroom. It focuses on learning process, such as observation, hands-on experience, learning-by-doing, problem-solving through an exposure to the environment and learning. The direct contact with the environment provides the relevant context for acquiring knowledge, skills, aesthetic appreciation and practical experience to learning. Environment damage can be minimised by developing the skills

and knowledge required for efficient resource utilisation, green processes and technologies and integrating these into our businesses and daily activities.

(iii) **Learning for the environment:** Learning for the environment aims at the development of an informed response and responsibility towards the environment.

Reduce, Reuse, Recycle

There are three Rs which you can apply for saving the environment – Reduce, Reuse and Recycle. It is a concept of the modern waste management.

Reduce: Do not use what you do not need. If we reduce at source, there is a lesser chance of waste generation and the pressure on our already stretched natural resources is reduced. On an individual level we can reduce the use of unnecessary items while shopping, buy items with minimal packaging, avoid buying disposable items and also avoid asking for plastic carry bags. Use your own reusable cloth or jute bags instead of plastic bags.

Reuse: Reuse the materials for other purposes, such as making pillow covers or rags out of used shirts or ladies suits.

Recycling: Recycling is reusing some components of the waste that may have some economic value. Recycling has readily visible benefits, such as conservation of resources reduction in energy used during manufacture and reducing pollution levels. Some materials, such as aluminum and steel can be recycled many times. Metal, paper, glass and plastics are recyclable. Plastic items are recycled into new plastic products. Kitchen wet waste can be utilised to make compost that can be used as an organic fertiliser. To do this every house should segregate the waste into wet and dry garbage. Wet garbage includes most kitchen wastes, which can be used for preparing vermicompost. Most dry garbage is recyclable. Several technological breakthroughs have recently been made to recover material from industrial waste. Non-toxic solid waste should be properly segregated and disposed of in landfills that are

properly sealed to avoid leakage and contamination of surrounding land and groundwater.

Let us now see some examples of 3 Rs (Table 5.4).

Table 5.4: Examples of Reduce, Reuse and Recycle

Reduce: Use less things	Reuse: Use things for longer time	Recycle: Use things in new or different ways
Paper for each notebook means cutting down of a tree. Do not leave too much spaces, while writing the text. Reduce the wastage of paper.	Use both sides of paper for writing. Give your old books and notebooks to someone who can use them. In this way, you will promote reuse of paper.	Paper is recycled into making paper again. It is also used to make *papier mache*, which is a composite material consisting of paper pieces or pulp which is sometimes reinforced with textiles, bound with an adhesive, such as glue, starch, or wallpaper paste.

Actions for saving the environment

Some actions that you can take for yourself and encourage your friends, family and neighbours to take are shown in Table 5.5.

Table 5.5: Actions for Saving the Environment

	Avoid	Prefer
Air pollution	Burning materials, for example burning wheat or rice straw in agricultural field	Using natural ventilation or fans in place of airconditioners
Energy use	Leaving electrical lights or appliances on, when not required	Using public transport buses and cycles (instead of cars), using solar or wind energy
Water pollution	Throwing waste in rivers and lakes	Using recycled water or water harvested through rains for watering garden plants
Waste	Using plastic bags	Segregating waste before throwing, so that the biodegradable waste can be harvested
Chemicals in food	Using chemical pesticides or fertilisers	Organic (natural and chemical free) food to promote organic farming
Forest Plants	Over-use of paper should be avoided	Reusing paper for making paper based products
Water	Over-use of water should be avoided	Reducing water use during bathing by using water filled in a bucket instead of shower

Practical Exercises

The teacher will facilitate these activities and give additional feedback and summarise for the students as needed.

Activity 1

Factors influencing the environment

Materials required

Pen and Notebook

Procedure

- Form groups of three students.
- Based on what you learnt about the environment and how different things or actions are effecting the environment, make a list of all factors (things or actions) that affect the environment.
- Think about all the articles you use daily that are made from plastic and answer the following questions
  (a) How plastic is made?
  (b) What are those plastic articles you usually use?
  (c) What effects does plastic have on our environment?
  (d) How can you reduce the amount of plastic you use?
  (e) What happens to plastic when you throw it away?
- Discuss these factors in detail. One volunteer group explains their list to the rest of the class who give feedback.

Activity 2

Steps you can take to save the environment

Materials required

Pen, Notebook

Procedure

- Use same groups as above.
- Think about your day from the time you wake up until the time you sleep. In this time, what steps can you take to help save the environment?
- Write a note on the actions that you would take at home or at school to do the following activities:
  (a) Collecting waste paper and reusing what is reusable (for crafts, papiermache, making rough books, etc.)
  (b) Encouraging use of both sides of paper.
  (c) Discouraging wastage and casual use of paper, pencils, etc.
  (d) Proper use of notebooks and not tearing out pages.
  (e) Discouraging use of throw away pens and encouraging use of refillable items.
  (f) Making rough pads with blank sheets from old notebooks.

Check Your Progress

A. Multiple choice questions

Read the questions carefully and circle the letter (a), (b), (c) or (d) that best answers the question.

1. What are some of the environmental changes caused due to modern methods of agriculture?
   (a) Chemical pollution due to fertilisers
   (b) Improvement in the environment
   (c) Lower air pollution due to crops
   (d) Decrease in forest areas
2. How can we conserve our health and environment? (Choose all the correct options)
   (a) Grow organic crops
   (b) Use natural fertilisers
   (c) Manage waste water
   (d) Use more air conditioning
3. A steel factory burns firewood and charcoal for heating and melting the steel? What are the possible effects on the environment? (Choose all the correct options)
   (a) Increase in global temperature
   (b) Decrease in global temperature
   (c) Increase in air pollution
   (d) Decrease in air pollution

B. Short answer questions

1. What are the five sources of energy available to us? Give two examples of each source?
2. What are the sources of pollution?
3. Classify the following under the three respective categories of natural resources:

Air, iron, sand, petroleum, wind, clay, fish, forest, gold, pearls.

Inexhaustible	Renewable	Non- renewable

What have you learnt?

After completing this session, you will be able to

- describe the relation between society and environment.
- identify common environmental problems.

Session 2: Conserving Natural Resources

In this session, you will learn about the actions that we can take to conserve natural resources. Conservation is the proper management of a natural resource to prevent its exploitation, destruction or degradation. Conservation is the sum total of activities, which can derive benefits from natural resources but at the same time prevent excessive use, which may lead to destruction or degradation. It means using them more efficiently and less wastefully.

As a first step, we can conduct the resource audit to examine the consumption of the resources and accordingly take measures to conserve them. For example, for an energy use audit, we can examine the use of the air conditioning system, ventilation system, light system and entry of sunlight into the room or the building. We can plan energy saving measures, such as cleaning the dust from the tubelights to get more light, regular servicing and maintenance of home appliances and switching off lights and devices when not in use, etc. to conserve energy. Energy conservation also help in saving fossil fuel and money.

Soil conservation

Soil conservation means checking soil erosion and improving soil fertility by adopting various methods. Soil conservation can be useful for the following:

1. Maintenance of soil fertility: The fertility can be maintained by adding manure and fertilizers regularly as well as by rotation of crop.
2. Control on grazing: Grazing should be allowed only on specified areas.
3. Reforestation: Planting of trees and vegetation reduces soil erosion.
4. Terracing: Dividing a slope into several flat fields to control rapid run of water. It is practised mostly in hilly areas.
5. Contour ploughing: Ploughing at right angles to the slope allows the furrows to trap water and check soil erosion by rain water.

Water conservation

Conservation and management of water are essential for the survival of mankind, plants and animals. This can be achieved by adopting the following methods:

1. Growing vegetation in the catchment areas, which will hold water in the soil and allow it to percolate into deeper layers and contribute to formation of ground water.
2. Constructing dams and reservoirs to regulate supply of water to the fields, as well as to enable generation of hydroelectricity.
3. Sewage should be treated and only the clear water should be released into the rivers.
4. Industrial wastes (effluents) should be treated to prevent chemical and thermal pollution of fresh water.
5. Judicious use of water in our day-to-day life.
6. Rainwater harvesting should be done by storing rainwater and recharging groundwater.
7. Watershed, which is a single unit of land with its water drainage system includes soil and water management for developing vegetative cover in the area.

Energy conservation

We use a lot of non-renewable energy resource for our needs. Since resources are limited, we need to conserve them as much as possible. Conservation of resources or energy means saving them and using them efficiently. Can you think of ways to save the natural resources? Some ideas have been given here in table 5.6.

Table 5.6: Ways of Conserving Energy

- Switch off lights, fans, TV and other electrical items, when not in use
- Use tube lights and energy efficient bulbs that save energy rather than bulbs.
- Keep the bulbs and tubes clean.
- Remove dust on the tubes and bulbs to improve lighting levels by 10 to 20%.
- Use pressure cooker to save energy required for cooking.
- Keep vessels covered with a lid during cooking. It is useful in cooking the food faster and saving energy.
- Electric items like air conditioners geysers, heaters and dryers use a lot of electrical power. Use them when necessary.

- Do not keep the door of a refrigerator open for a long time.
- Cool hot food before putting in the refrigerator.
- Use methods of cooking that use less energy, like use a pressure cooker or solar cooker to cook food.
- Travelling in a bus or travelling in a group in a carpool is better than going alone in a car.

Do you know?

In the long-term, renewable energy will be cheaper and will cause less pollution.

Food conservation

Food conservation and storage have been practiced to feed mankind in times of shortage. Food is stored in warehouses on large scale and in refrigerators at home. Food is also preserved through various methods to prevent the spoilage due to harmful bacteria and other microorganisms.

Forest conservation

Forest conservation means the retention of existing forest or the creation of new forest at the levels prescribed by the State or local authority. Participation of the community living in and around the forest is important for the success of the forest conservation programme.

Practical Exercises

The teacher will facilitate these activities and give additional feedback and summarise for the students as needed.

Activity 1

Conserving natural resources

Material required

Pen, notebook, chart paper, colours, crayons etc.

Procedure

- Form a group with four students in each group.
- Make a list of all the energy or natural resources you use in a day, such as petrol or diesel for coming to school in a bus, electricity for light, etc. Then make a list of how you can reduce the amount of resources in each step.
- Make a poster on 'Conserving the Environment'. Write short note on the following topics:
  (a) Rain water harvesting
  (b) Home composting
  (c) Garden on terrace,
  (d) Organic gardening
  (e) Drip irrigation

Check Your Progress

A. Multiple choice questions

Read the questions carefully and circle the letter (a), (b), (c) or (d) that best answers the question.

1. What does conservation of energy mean? (Choose all options that apply)
   (a) Saving energy
   (b) Producing energy
   (c) Using energy efficiently
   (d) Creating energy sources
2. Which of the following are non-renewable resources? (Choose all options that apply)
   (a) Coal
   (b) Diesel
   (c) Sun
   (d) Water
3. Which of the following is an example of renewable resources?
   (a) Coal
   (b) Solar Energy
   (c) CNG
   (d) Petroleum

B. Short answer questions

1. Write any three actions which you can take to conserve energy.
2. Describe any three methods of water conservation.
3. What is the purpose of soil conservation?
4. State any three ways by which we can save energy.

What have you learnt?

After completing this session, you will be able to

- describe methods of conservation of energy resource.
- differentiate between renewable and non-renewable resources.
- demonstrate the knowledge of conserving electricity, water, energy, etc.

Session 3: Sustainable Development and Green Economy

The current strategies of economic development are using up resources of the world so rapidly that our future generations, the young people of the world, would have

serious environmental problems, much worse than those that we are facing at present. With increasing population and income, the consumption of goods is increasing day by day. This has led to increase in production and utilization of natural resources, which are required for producing goods. Society must thus change its unsustainable development strategy to a new form where development will not destroy the environment. This form of sustainable development can only be brought about if each individual practices a sustainable lifestyle. Since most of the natural resources are scarce, therefore, judicious utilisation of resource is necessary.

Now let us try to understand the meaning of sustainable development. Sustainable development is defined as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development, 1987). For example, sustainable agriculture consists of environment friendly methods of farming that allow the production of agricultural crops or livestock without damage to human or natural systems. It also involves preventing the use of chemicals so as to avoid adverse effects to soil, water and biodiversity.

Biological diversity or biodiversity in short is that part of nature which includes the differences in genes among the individuals of a species, the variety and richness of all the plant and animal species at different scales in space, locally, in a region, in the country and the world, and various types of ecosystems, both terrestrial and aquatic, within a defined area. Biological diversity is essential for preserving ecological processes, such as fixing and recycling of nutrients, soil formation, circulation and cleansing of air and water, global life support (plants absorb CO_2, give out O_2), maintaining the water balance within ecosystems, watershed protection, maintaining stream and river flows throughout the year, erosion control and local flood reduction.

What is sustainable development?

Sustainability is the development that satisfies the needs of the present without compromising the capacity

of future generations, guaranteeing the balance between economic growth, care for the environment and social well-being. Sustainable development is a concept that appeared for the first time in 1987 with the publication of the Brundtland Report, warning of the negative environmental consequences of economic growth and globalisation.

Sustainable development includes the following:

- reducing excessive use of resources and enhancing resource conservation.
- recycling and reuse of waste materials.
- scientific management of renewable resources, especially bio-resources.
- planting more trees.
- green grassy patches to be interspersed between concrete buildings.
- using more environment friendly material or biodegradable material.
- use of technologies, which are environmental friendly and based on efficient use of resources.

"The principle of common but differentiated responsibilities is the bedrock of our enterprise for a sustainable world"

Narendra Modi
Prime Minister of India

Sustainable Development Goals

The Sustainable Development Goals (SDGs), otherwise known as the Global Goals, are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. The Sustainable Development Goals (SDGs) were launched at the United Nations Sustainable Development Summit in New York in September 2015, forming the 2030 Agenda for Sustainable Development. The 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs) adopted by world leaders in 2015, embody a road map for progress that is sustainable and leaves no one behind. The SDGs have been framed with the objective to address vital issues facing businesses, governments and society, such as poverty, gender equality, water use, energy, climate change and biodiversity. Countries are now establishing policies and regulations that will promote sustainable systems needed in all economic sectors to provide a secure, affordable, and sustainable economy. The core

skills identified as necessary for the green worker include environmental awareness and willingness to learn about sustainable development as well as general learning and decision-making ability.

Green growth

The concept of green growth aims at achieving economic growth that is socially inclusive and environmentally sustainable. The Ministry of Environment, Forest, and Climate Change, Government of India recognized green growth in its vision, wherein 'poverty eradication' along with green growth is to be seen as the focal point for green economy.

The Finance Commission of India articulated green growth as involving "rethinking growth strategies with regard to their impact(s) on environmental sustainability and the environmental resources available to poor and vulnerable groups." The extent to which its economy will "grow green" will depend on its ability to reduce the quantity of resources required over time to support economic growth that leads to enhancement of social equity and job creation. Green growth could play an important role in balancing these priorities.

To ensure sustainable development, any activity that is expected to bring about economic growth must also consider its environmental impacts so that it is more consistent with long term growth and development. This means vehicles on the road which leads to traffic congestion, waste of time for all the commuters, and a great load of particulate matter and carbon monoxide from the exhaust of vehicles should be slowly replaced with an efficient public transport system.

Green Economy

The term 'Green Economy' was first coined in a 1989 report for the Government of the United Kingdom by a group of leading environmental economists, entitled Blueprint for a Green Economy. UNEP has defined the green economy as "one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities.

It is low carbon, resource efficient, and socially inclusive" (UNEP, 2011). A 'Green Economy' is a system which helps in economic growth while at the same time, taking care of the environment as shown in Figure 5.1.

Certain ways of economic growth, such as building factories, using chemicals for more crops, etc., harm the environment. Some ways of saving the environment, such as not using fertilisers will harm the economy of the farmers. But then, both the environment and economy are important for us as a society. As people begin to learn about the serious health hazards caused by pesticides in their food, public awareness can begin putting pressures on farmers to reduce the use of chemicals that are injurious to health. In the longer term, as people become more conscious of using 'green products' made by ecosensitive industries, the products that cause severe damage to the environment may not be used.

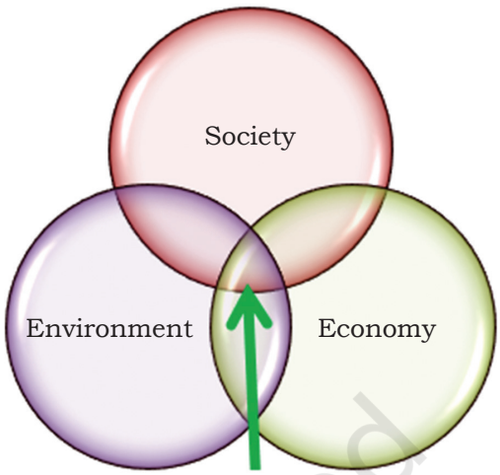

Fig. 5.1 Green Economy

Green Consumer

A green consumer is someone who is very concerned about the environment and, therefore, only purchases products that are environment-friendly or eco-friendly. Products with little or no packaging, products made from natural ingredients and products that are made without causing pollution are all examples of eco-friendly products.

Components of a Green Economy

A green economy includes the following components as shown in Table 5.7.

Table 5.7: Components of a Green Economy

Renewable energy 	Renewable energy from renewable resources like wind, water, sun, earth, biomass, etc., are available in large quantities and cause less pollution. India ranks amongst the top 10 countries for production of renewable energy through solar, wind and biomass.

Green building 	Green buildings are buildings that cause minimum damage to the environment during their construction and operation. They use energy, water, and other resources wisely, with minimum waste.
Well-managed (Sustainable) transport 	Sustainable means what is good for the economy as well as the future of the environment. A sustainable transport system will cost less, help more people to move quickly and cause less or no damage to the environment.
Water management 	We need to avoid water pollution and not waste water. We should not waste water, rather we should recycle it for various purposes.
Waste management 	All wastes result in loss of resources and increases land, water and air pollution. You can prevent this by separating waste before throwing. Using the 3Rs—Reduce, Reuse and Recycle will help in managing waste material.
Land management 	Land is used for farming, forests, factories, homes, roads, etc. In a green economy, land is used in a way that it meets the requirement of people without causing damage to the environment.

In other words, we can say that a green economy uses less resources, causes less pollution and provides growth for everyone.

Skill development for Green Economy

The key challenges for India are to expand access to food, energy, water and other essential goods and services to its growing population. It needs to work towards the objective of alleviating poverty and catalysing sustainable development. The development of skills for green jobs is crucial to ensuring an efficient transition from

unsustainable to a green economy by matching supply and demand for skills. A green job can be with business, nonprofit organizations, government or education. Some green jobs may have specific requirements for green skills, such as organic farmer needs to have a knowledge and skills for growing organically certified crops. Solar technicians or engineers should possess the knowledge and skills for design, installation and maintenance of solar panels and appliances. Other green jobs may not necessarily require specific skills, for example a graphic designer or a cashier working for a green company or organization will be contributing to the development of green growth and economy.

Green skills

The skills used for promoting green economy are known as green skills. These skills are needed in areas similar to renewable energy, sewer water treatment, climate resilient cities, green construction, solid waste management,etc. The Green Skills Agreement defines skills for sustainability as "Skills for sustainability, also known as green skills, are the technical skills, knowledge, values and attitudes needed in the workforce to develop and support sustainable social, economic and environmental outcomes in business, industry and the community." Some of the areas in which green skills contribute to the sustainable development are as follows:

- using renewable energy (example, using solar power and wind energy)
- water and waste management
- rain water harvesting
- conserving energy
- reducing pollution

Green skills

Green skills are those skills required to adapt processes, services and products to climate change and the environmental rules and necessities related to it. They embrace the information, abilities, values and attitudes required to live in, develop and support a sustainable and resource-efficient society.

Green skilling is crucial for making a transition from energy and emissions—intensive economy to cleaner and greener production and service. It also prepares people for green jobs that contribute to preserving or restoring the quality of the environment, while improving human well-being and social equity. Many technologies have been developed to make use of the solar energy,

such as solar lights, solar cooker, solar water heaters, etc. The installation of the solar panels and appliances requires engineers and technicians.

Green Consumer Day is celebrated on September 28 of each year. It is a day when people celebrate the earth and bring about awareness on how small actions can help earth to remain green and clean. People tend to recycle more than usual on that day and wear the colour green to express to the world their feelings regarding the universe and mother nature.

Most vocational training programmes focus on vocational or technical skills rather than 'soft' or 'green' skills. Green skills contribute to preserving or restoring environmental quality for sustainable future and include jobs that protect ecosystems and biodiversity, reduce energy and minimise waste and pollution. The National Skill Development Mission, which was officially launched by Government of India in 2015 has been developed to create convergence across sectors and States in terms of skill training activities, including green skills. The knowledge and skills that may be needed for managing resources and supporting efficiency have been summarised in Table 5.8.

Green skills are going to be more important in the future as all countries will move towards a greener economy. Good communication skills are also needed so that workers in different sectors can work together

Table 5.8: Knowledge and skills needed for managing resources and supporting efficiency

S.No.	Purpose	Knowledge and skills needed for green economy
	Manage natural resources	• To assess environmental impact • To design and adopt technologies that help in reducing the consumption of natural resources • To understand legislation and guidelines for sustainable utilisation of natural resources
	Support climate resilience	• To develop models for interpreting climate change projections • To develop risk management strategies for future resource availability • To adopt technologies that improve resilience
	Support resource efficiency	• To develop resource efficient business models • To develop and adopt technologies that maximises resource utilisation and reduces waste
	Support low carbon industry	• To develop technologies that promote renewable energy sources (wind, solar, water) • To design and adopt technologies and products that minimises carbon emissions

effectively towards green solutions. In the green building sector, for example, the ability to work with other trades is critical to improving a building's energy efficiency. The Ministry of Environment, Forest and Climate Change has taken up an initiative for skill development in the environment and forest sector to enable India's youth to get gainful employment and/or self-employment, called the GREEN SKILL DEVELOPMENT PROGRAMME (GSDP). The programme endeavours to develop green skilled workers having technical knowledge and commitment to sustainable development, which will help in the attainment of the Sustainable Development Goals.

Environmental change can be seen as an important factor that affects labour demand and skills supply across all sectors, such as Automotive, Retail, Electronics, Power, Construction, etc., which impacts the economy. Green Skills thus, are the skills that aim to balance economic development with environmental conservation so that the needs of the society, economy and environment are efficiently met, with minimum damage to the environment.

What are green jobs?

A 'green job' is employment in any industry that contributes to preserving or restoring environmental quality in that sector and allowing for sustainable development. It includes jobs that help protect ecosystems and biodiversity and reduce energy, materials and water consumption through high efficiency strategies. Green jobs can be in any sector, such as agriculture, manufacturing, research and development activities, etc. They can bring about the much needed transition from high carbon to low carbon economy by promoting environment friendly technologies. A rise in green buildings and energy efficiency is increasing the demand for architects, engineers, technicians, plumbers, construction workers, etc. Some of the sectors, which have the potential for green jobs are as follows:

S.No.	Sector	Areas/Field	Green Jobs
	Agriculture	• Organic farming • Watershed management • Rain water harvesting	• Water quality technician • Rain water harvesting professionals and technician • Solar pump technician • Greenhouse or polyhouse professionals and technicians
	Construction	• Planning, design and manufacturing of energy efficient lighting appliances and equipment • Increasing efficiency of existing buildings through energy audits • Planning, design, and construction of green buildings • Green plumbing, using sensor based equipment	• Green builders • Green design professionals • Green workers
	Energy	• Research, construction, and monitoring of power plant, including plant efficiency and carbon sequestration • Increased power plant efficiency	• Solar Cell Technicians and Engineers • Wind energy professionals • Wind energy workers • Biofuel professionals • Wave energy producers
	Forestry	• Reforestation and afforestation projects • Agroforestry and vertical farming for better utilisation of natural resources.	• Natural scientists
	Manufacturing	• Pollution control • Energy efficiency • Recycling waste materials	• Recyclers
	Retail	• Greener products and specifically targeted green stores	• Green salesperson • Accountants • Cashiers • Sales associates
	Automotive and Transport	• Research and design on more fuel efficient vehicles and on public transport systems • Manufacture of alternatively fuelled vehicles	• Clean car engineers

	Tourism and Hospitality	• Eco-friendly practices, such as centralized lighting and air conditioning systems for saving electricity • Eco-tour guides	• Eco-tour guides • Green tour guides
	Education	• Research and development activities for promoting green growth and economy • Teaching environmental education • Research and development in conservation of natural resources	• Teachers teaching environmental education • Green scientist • Conservation biologists

Green projects

Many people and organisation are concerned and motivated about doing something to save the environment. They are implementing green projects in areas like waste management, energy conservation, green sanitation, biofuel use, green buildings, etc. Examples of the green projects undertaken by some of the organisations are given in Table 5.9 to highlight the various aspects of green practices and techniques that could help us in saving our environment and making our efforts more focused for sustainable development and growth.

Table 5.9: Examples of Green Projects

Solid Waste Management by 'Swachh Cooperative'

'Swachh Cooperative' is wholly owned by waste pickers. The Cooperative has members who are engaged in door step collection of waste in Pune. This integrates informal waste pickers into Pune city's Solid Waste Management system. This project has become a success with the support of government and the waste-pickers. Waste pickers now work with dignity and provide a decentralised waste management system. They ensure efficient disposal of wet waste through biogas regeneration, along with recycling of solid waste. Biogas is produced from plant material and animal waste, garbage,

waste from households and some types of industrial wastes, such as fish processing, dairies, and sewage treatment plants. It is a mixture of gases which includes methane, carbon dioxide, hydrogen sulphide and water vapour. In this mixture, methane burns easily.

Modern *Chulha* of 'Society of Development and Environment Protection'

Energy efficient cooking stoves or 'chulas' help the movement of air through it so that the wood is burnt more efficiently. The Society of Development and Environment Protection developed the 'Modern DEEP (Development and Environment Protection) Chulha' that uses biomass to reduce consumption of wood by 50%. This chulha reduces smoke by 80%, reducing environmental and health problems. The project trains masons and welders, to produce the chulhas, thus increasing employment and entrepreneurship opportunities. The initiative was started in 35,000 households of Solan district in Himachal Pradesh in 1995.

Biotoilet by 'Green Solution Foundation'

GSF (Green Solution Foundation) has created a bio-toilet solution for hygienic sanitation in villages and slums in cities that lacked sewage systems. Users or donors fund these bio-toilets while GSF provides training on toilet use and servicing involving the local population, thus creating employment and entrepreneurship opportunities.

The Bio-digester tank forms the basis for this eco-friendly toilet. Using aerobic bacteria, this tank converts human waste into environment standard compatible water, which is used for flushing, or even for irrigation.

Green benefits

- Water conservation due to less flushing
- Efficient sewage system
- Decrease in soil and water contamination
- Decrease in diseases due to hygienic sanitation.

Practical Exercise

The teacher will facilitate these activities and give additional feedback and summarise for the students as needed.

Activity 1

Importance of Green Skills

Procedure

- Form groups of 3–4 people in each group.
- Within your group, discuss the importance of green skills and their role in making a green economy.
- One volunteer group explains the importance of green skills and a green economy to the rest of the class.

Activity 2

Importance of green economy

Materials required

Pen, chart paper, colours, crayons

Procedure

1. Keep the same group as the previous activity.
2. Make a poster on 'Importance of a Green Economy' using the points from your previous discussion. You can use magazine and newspaper cuttings.

Check Your Progress

A. Multiple choice question

Read the questions carefully and circle the letter (a), (b), (c) or (d) that best answers the question.

1. Which of the following options describe a green economy correctly? A green economy _____.
   (a) uses less resources
   (b) uses more resources
   (c) wastes less items
   (d) wastes more items

B. Short answer questions

1. What are green skills?
2. Give two examples of green skills that you can start learning from now.

What have you learnt?

After completing this session, you will be able to

- demonstrate the knowledge of green skills, green economy and green jobs.
- identify the green jobs in various sectors.